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Briefing Report to the Honorable David E. Skaggs, House of Representatives

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NUCLEAR HEALTH AND SAFETY

Summary of Major Problems at DOE's Rocky Flats Plant

GAO

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Resources, Community, and
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The Honorable David E. Skaggs
House of Representatives

Dear Mr. Skaggs:

On July 12, 1988, you requested that we summarize the major environmental, safety, and health (ES&H) problems at the Department of Energy's (DOE) Rocky Flats Plant. The plant is located in Colorado and is the focal point for DOE's plutonium operations. In summary, there are three categories of problems.

-- Safety and health concerns: Over the past 2 years, a wide variety of safety and health concerns have been raised by DOE headquarters' ES&H staff. Of particular concern have been inadequate management attention to the plant's health and safety programs, deficiencies in the plant's radiological protection program, and the need for enhancing fire protection.

-- Environmental contamination: The groundwater at the installation is contaminated with various chemicals and/or radioactive material. Further, 108 inactive waste sites are located at the plant. Some of these sites contain hazardous and/or radioactive material and are suspected of causing the existing groundwater contamination.

-- Aging equipment and buildings: Much of the plant was built in the 1950s. The aging of some buildings has resulted in operational problems and, in some cases, safety concerns.

These problem areas are long-standing and have been previously reported by us or others. Rockwell International, the plant's contractor, has a number of corrective actions underway. However, resolution of these problems will not be quick or inexpensive. A recent incident at the plant involving the contamination of three individuals and the shutdown of one building is, in our

view, strong evidence that serious problems persist at the plant. A concerted and sincere effort by DOE and the plant's contractor will be needed for many years to resolve the plant's problems.

The three major problem areas and the key events surrounding the recent shutdown are highlighted below. Sections 1 through 4 provide an overview of the plant's operation and discuss the major problem areas in more detail.

SAFETY AND HEALTH CONCERNS

Since June 1986, DOE has performed three Technical Safety Appraisals (TSA) at Rocky Flats Plant. Collectively, these TSAs have identified 230 recommendations and/or concerns covering a wide range of safety and health disciplines. Of particular interest was that many of the recommendations and/or concerns applied to more than one building, indicating that the problems probably were widespread. In general, there are three important safety and health problem areas. They relate to (1) management attention to the plant's safety and health programs, (2) radiological protection, and (3) fire protection.

In regard to management attention to internal safety and health programs, the TSAs found that many persons at the plant had both programmatic and safety oversight responsibilities. The TSAs also noted a lack of specific safety objectives and goals (e.g., lost workdays for injuries) and the need to strengthen the plant's internal safety and health oversight to ensure that corrective actions are completed and effective.

Problems with the plant's radiological program include deficiencies in calibrating radiation monitoring equipment, the need to upgrade radiological air monitoring capabilities at the plant (e.g., more sensitive monitors and better placement of monitors), and a lack of understanding by plant personnel regarding DOE's "As Low As Reasonably Achievable" (ALARA) program--a program designed to minimize any exposure to radiation. The TSAs also pointed out that workers' attention to radiological protection needs to be increased. For example, workers had been observed handling contaminated items without surgical gloves.

In the fire protection area, the TSAs pointed out that some buildings lack earthquake bracing for sprinkler systems, many of the buildings have antiquated fire detector/alarm

systems, and enhanced fire protection is warranted in some locations. The TSAs were also critical of the plant's housekeeping practices, specifically in maintaining fire doors, limiting the storage of combustibles, and clearly marking egress routes.

Because of the seriousness of the safety and health concerns at the plant, DOE, in February 1988, instituted a series of short-term measures to improve conditions at the plant. These included setting up a 24-hour surveillance of the plant by DOE staff, establishing an outside team of specialists to assist in developing an improved safety and health program, and providing additional DOE staff on-site to monitor the plant's corrective actions. Numerous corrective actions have been undertaken at the plant and according to the plant's staff, many improvements are being made in reorganizing safety and health functions, calibrating radiation equipment, increasing worker attention to radiological protection, and improving the plant's housekeeping practices. However, an internal plant appraisal dated September 9, 1988, and other recent DOE documents indicate that improvements in the plant's safety and health programs are still needed. Furthermore, headquarters safety officials told us that Albuquerque Operations Office officials have not provided the plant contractor with the proper direction, emphasis, and guidance. (See section 2.)

ENVIRONMENTAL CONTAMINATION

There are two major interrelated environmental contamination problems at the plant: groundwater contamination and inactive waste sites. Both problems have existed for a long time and will be very costly to correct.

The groundwater at the plant is contaminated with various chemicals, including nitrates, solvents, and radioactive elements. Solvents appear to be the more serious problem in that at some locations the levels are as much as 1,000 times the drinking water standard. Although there is no evidence that groundwater contamination has moved off-site, DOE officials recognize the potential health threat with the migration of the contamination. Inactive waste sites are one of the principal causes of groundwater contamination. A total of 108 sites had been identified at the plant as of September 1988. These sites include a number of locations where hazardous and/or radioactive materials are known to be or are suspected of being buried.

These two environmental problems are being addressed under a compliance agreement between the State of Colorado, the Environmental Protection Agency, and DOE. Accordingly, the plant's staff is studying the nature and extent of the threat to the public and developing remedial action programs. DOE estimates that it may cost $323 million through fiscal year 1995 to correct or reduce the environmental contamination and that an additional $120 million to $180 million may be needed after that to complete environmental corrective action. Even with this amount of funding, some waste may still remain at the Rocky Flats Plant and necessitate continual monitoring. (See section 3.)

AGING EQUIPMENT AND BUILDINGS

Much of Rocky Flats Plant was built in the 1950s and thus does not meet today's standards and codes. Some buildings have deteriorated to the point where they now have operational problems. Many of the buildings need considerable maintenance on a day-to-day basis. In a 1987 strategic planning effort, DOE rated some of the buildings at the plant "marginal." Further, according to DOE analyses, many of the buildings at the plant are vulnerable to earthquakes and high winds. Finally, one of the more recently constructed buildings (371) does not operate because of the poor design of the production processes in the building.

The condition of various buildings has important safety implications. The fire and criticality alarm systems are old. Some aspects of these systems do not meet current codes and replacement parts are difficult to obtain. Some buildings have pre-1960 wiring and need improved ventilation. Finally, because building 371 does not operate, work is continuing in older buildings where the potential for radiation exposure to workers is greater than it would be if building 371 was operational.

DOE is currently developing cost estimates for modernizing all its nuclear defense facilities, including Rocky Flats Plant. Preliminary estimates by DOE indicate that rebuilding and upgrading the plant may cost over $1 billion. A modernization plan for DOE's complex, including the future utilization of Rocky Flats Plant, is scheduled to be issued on December 15, 1988. (See section 4.)

SHUTDOWN OF BUILDING 771

On September 29, 1988, the DOE headquarters ES&H site resident and two plant employees were exposed to contamination in building 771 when they walked through a contaminated area without respirators. This incident occurred because the sign warning that respirators are required was apparently hidden from view by waste drums and a tool box. This incident precipitated a review of the building's operations by DOE headquarters ES&H staff.

On October 6, 1988, the staff reported that inadequate radiological safety margins exist at the building. Among the staff's concerns were the frequent need for respirators in the work areas, a general lack of cleanliness and good housekeeping practices, inadequate air sampling to monitor radiation levels, and a weak health physics program for the building (e.g., the need for additional health physicists). A secondary but complicating factor is the fact that the building is 35 years old and in need of continual repair. Renovations of the building were being carried out simultaneously with normal plant operations.

On October 7, 1988, after discussions with DOE's headquarters ES&H staff and DOE's defense program officials, DOE's Albuquerque Operations Office ordered the shutdown of activities in building 771. Shutdown operations began October 8, and DOE expects the entire operation to be shut down on or before November 4, 1988. DOE is currently developing a restart plan before resuming operations in building 771. DOE officials believe that production operations at the building could resume about 1 to 2 months after a complete shutdown.

OBSERVATIONS

The recent shutdown order of building 771 appears to be symptomatic of conditions that have persisted at the plant for some time. DOE's TSAs over the last 2 years have shown repeated deficiencies in many areas, particularly in the radiological protection program. And although numerous corrective actions are underway at the plant, the recent shutdown of building 771 clearly shows that more needs to be done to ensure that safe operations are carried out at Rocky Flats Plant.

It is our view that the situation at the plant is not amenable to any quick solution. Many corrective actions in

the environmental area, such as groundwater cleanup, are by their nature long-term. Other problems, such as weaknesses in the plant's radiological protection programs, appear to persist even after corrective action has been taken. DOE headquarters ES&H staff is planning a comprehensive review of the plant in November 1988. During this review, ES&H staff, among other things, will evaluate the plant's progress in implementing effective corrective action in regard to previous TSA findings.

We believe that as part of this review, DOE should consider long-term actions to improve conditions at the plant, such as bringing in additional health physics personnel from other DOE installations and requiring greater hands-on monitoring and oversight by DOE (e.g., daily surveillance of actual operations). We also believe that DOE should establish a timetable for correcting the 230 open recommendations.

We are planning a more detailed review of events surrounding the shutdown of building 771 and DOE's implementation of the cost-plus-fee-award contract with the plant's contractor. This work is planned to begin in November 1988. We also plan to issue a report to the Secretary of Energy in the near future that will contain recommendations to strengthen DOE's overall safety program. Some of these recommendations will be pertinent to safety oversight at Rocky Flats Plant.

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The information contained in this report was, to a large degree, based on our previous reports (see appendix I) and DOE assessments at Rocky Flats Plant. We also reviewed pertinent internal documents at the plant and DOE headquarters. We interviewed responsible officials at DOE headquarters and the Rocky Flats area office to gain a better understanding of the major problem areas at the plant. Information was also obtained and discussed with the plant's contractor personnel. This work was performed between August 1988 and October 1988 in accordance with generally accepted government auditing standards. We discussed the contents of this report with cognizant DOE officials, who generally agreed with the information presented. However, as you requested, we did not obtain official agency comments on a draft of this report.

Unless you publicly announce its contents earlier, we plan no further distribution of this report for 30 days from the

date of this letter. At that time, we will send copies to appropriate congressional committees; the Secretary of Energy; and the Director, Office of Management and Budget. We will also make copies available to others upon request.

Major contributors to this report are listed in appendix II.

Sincerely yours,

Keith O. Fultz

Keith O. Fultz
Senior Associate Director

CONTENTS

		Page
LETTER		1
SECTION		
1	OVERVIEW OF ROCKY FLATS PLANT OPERATIONS	9
2	SAFETY AND HEALTH CONCERNS	10
	Inadequate Management Attention to Safety and Health Programs	10
	Improvements Needed in Radiological Protection	12
	Improvements Needed in Fire Protection	13
3	ENVIRONMENTAL CONTAMINATION AT ROCKY FLATS PLANT	15
	Groundwater Contamination	15
	Inactive Waste Sites	16
	DOE Future Actions	17
4	AGING EQUIPMENT AND BUILDINGS	19
	Marginal Operation	19
	Vulnerability to High Winds and Earthquakes	20
	Building 371 Needs To Be Rebuilt	21
	Future Cost	21
APPENDIX		
I	GAO REPORTS AND TESTIMONIES ON ENVIRONMENT, SAFETY, AND HEALTH AT DOE NUCLEAR DEFENSE FACILITIES	22
II	MAJOR CONTRIBUTORS TO THIS BRIEFING REPORT	25

ABBREVIATIONS

ALARA	As Low As Reasonably Achievable
DOE	Department of Energy
ES&H	environmental, safety, and health
EPA	Environmental Protection Agency
GAO	General Accounting Office
RFP	Rocky Flats Plant
TSA	Technical Safety Appraisal

SECTION 1

OVERVIEW OF ROCKY FLATS PLANT OPERATIONS

Rocky Flats Plant (RFP) is located on a 6,550 acre site in Northern Jefferson County, Colorado, and is operated by Rockwell International Corporation, North American Space Operations Group, under a contract with the Department of Energy (DOE). RFP began operations in 1952 with 20 buildings, but now more than 100 buildings are used in performing its mission.

The primary mission of RFP is the production of component parts for nuclear weapons. The plant is the focal point for DOE's plutonium operations. Accordingly, the plant has a variety of production activities that involve the fabrication of parts from plutonium, uranium, and other materials for nuclear weapons. Components from obsolete nuclear weapons are also processed at RFP to recover plutonium and other reusable material. Key operations at the plant include: weapons component fabrication using plutonium (building 707); plutonium residue recovery (buildings 776/777 and 771/774); waste management (buildings 374 and 774); and nonplutonium component fabrication (buildings 444, 460, and 883). Finished products are shipped to another DOE installation for assembly into weapons.

RFP operations routinely involve handling radioactive, hazardous, and/or toxic material. Also, many plant operations use fissionable material (material that can sustain a nuclear reaction), which must be handled with specialized equipment. Because of the inherent dangers, management at RFP must pay constant attention to all aspects of the plant's operation to ensure that they are carried out in a safe and environmentally acceptable manner. Concerns have been raised over the years about the plant's safe operation, environmental contamination, and the effects of age on the plant's buildings and equipment. These concerns have led to increased oversight by DOE. DOE headquarters environmental, safety, and health (ES&H) staff is planning a comprehensive review of the plant in November 1988.

SECTION 2

SAFETY AND HEALTH CONCERNS

To enhance ongoing safety and health programs and identify safety issues at DOE facilities, Technical Safety Appraisals (TSAs) are conducted by a team of specialists led by senior staff from DOE headquarters. The team is composed of outside consultants and experts from DOE's national laboratories. DOE's TSAs have generally focused on specific facilities within the DOE nuclear defense complex. Since June 1986, three TSAs have been conducted at Rocky Flats Plant (RFP): one each for building 707, building 771/774, and building 776/777. Collectively, these TSAs have listed 230 recommendations and/or concerns covering a wide range of safety and health disciplines. Of particular interest is that successive TSAs often made the same recommendation. In the view of DOE safety staff at headquarters, this showed a lack of commitment by the RFP contractor--Rockwell International--to correcting safety problems.

Because of the persistent safety and health concerns at RFP, DOE initiated, in February 1988, short-term "compensatory" measures to ensure worker protection. These measures included providing 24-hour surveillance of the plant by DOE safety and health staff, establishing an outside team of specialists to assist in developing an improved safety and health program, and detailing additional DOE staff on-site to monitor the plant's corrective actions. Programs and/or corrective actions have been initiated at the plant by the contractor to address all the recommendations and/or concerns. As of October 14, 1988, contractor plant staff considered 67 of the 230 recommendations and/or concerns closed. None of the recommendations and/or concerns have been closed by DOE.

In general, there are three important safety and health problem areas associated with RFP: (1) inadequate management attention to the plant's safety and health programs, (2) deficiencies in the radiological protection program, and (3) the need for increased fire protection. The following sections briefly describe the problem areas and the current status of efforts to resolve them.

INADEQUATE MANAGEMENT ATTENTION TO SAFETY AND HEALTH PROGRAMS

- The management structure at RFP needs to be improved. DOE's TSAs found that many persons charged with safety oversight responsibilities at the plant also had programmatic responsibilities. Further, persons with safety

responsibilities did not always have the authority and resources to carry out their responsibilities.

  -- RFP is taking steps to reorganize its management functions. These steps include revising and clarifying the functions of RFP's internal safety staff, establishing an Executive Safety Review Board, and revising plant policy and job descriptions to clarify safety responsibilities at managerial and supervisory levels.

  -- A recent internal overview appraisal by RFP management, dated September 9, 1988, found that there was still some confusion regarding responsibilities of plant staff for safety matters. Further, the study found that some safety and health organizations are understaffed.

- RFP management needs to establish quantitative safety objectives and goals. According to DOE's TSAs, specific safety performance targets (e.g., lost workdays for injuries) have not been established in some buildings. The TSAs also noted an increasing trend toward an excessive number of minor injuries.

  -- RFP management has begun programs to establish safety targets, conduct safety awareness programs, and analyze and track safety performance.

  -- A recent internal overview appraisal by RFP management, dated September 9, 1988, found no measurable safety goals in buildings 707 and 776/777.

- RFP management needs to strengthen its internal oversight program to ensure that recommendations are followed up and that needed actions are taken. Numerous concerns in DOE's TSAs suggest a lack of management attention toward safety issues. Many of the concerns were repeated in the TSAs conducted over a 2-year period. RFP management has recently established a safety audit function that will coordinate all safety audit activities at RFP. This function will also provide centralized control and oversight for tracking safety-related actions.

- Worker attention to radiological protection needs to be increased. According to the TSAs, workers have been observed handling contaminated items without surgical gloves, not surveying themselves for contamination, and improperly wearing dosimeters (badges used to measure exposure to radiation). The plant management has taken a number of steps to increase workers' attention to protecting themselves. These include revising plant policies, closely

monitoring workers to ensure that they are monitoring themselves, and modifying the plant's coveralls to include a badge holder for correct positioning of the dosimeter.

IMPROVEMENTS NEEDED IN RADIOLOGICAL PROTECTION

- All three TSAs found problems with the plant's radiological protection program. The TSA findings raised questions about the plant's commitment to the program.
  - -- The plant has instituted a major overhaul of its radiological protection program. A Quality Assurance Manager and Audit Program Administrator have been appointed. Efforts to hire additional staff are underway, and a "self-improvement plan" has been developed.
  - -- According to a September 9, 1988, internal appraisal, further improvements are still needed. Building managers have not established radiological improvement goals, staffing is not complete, and there is no evidence that internal audits are being carried out. A September 29, 1988, DOE appraisal found that RFP requirements and procedures will require significant improvement to ensure that airborne radioactive areas are properly identified, controlled, and consistently posted.
- The TSAs found that procedures for calibrating radiation monitoring instruments were weak and poorly documented. The accuracy of such instruments is important to ensure that workers and the public are not exposed to unnecessary levels of radiation. Problems included using different calibration techniques in different buildings and not testing the instruments with appropriate radiation sources.
  - -- The system for calibrating radiation instruments is being upgraded at the plant. According to plant officials, new equipment has been purchased, procedures for calibrating and adjusting instruments have been standardized, and improved training programs have been implemented.
  - -- While improvements are underway, RFP staff told us that some instruments cannot be calibrated to a national standard at high radiation ranges. Also, according to a plant document, the calibration of instruments is still not consistent (different methods have been used) from building to building.

- A new centralized calibration facility is needed to ensure that all radiation detection equipment is uniformly calibrated to national standards throughout the plant. Plant officials told us that a new facility is planned and should be operational in March of 1990.

- Air monitoring radiation at the plant for needs to be upgraded. The TSAs identified a number of problems with the plant's air monitoring systems, including the need for more sensitive air monitors, the need to study air flows, insufficient ventilation, and improper use or placement of air monitors. Actions being taken by the plant to improve air monitoring include the purchase and installation of more air monitors, a study to determine air flow patterns, and the development of new, more sensitive air monitoring equipment.

- RFP's program for keeping worker exposure as low as possible--called the As Low As Reasonably Achievable (ALARA) program--needs improvement. According to a September 9, 1988, internal appraisal, plant personnel, including those who monitor radiation, have a limited understanding of how to apply an ALARA program in their particular building. Few people could describe the radiation exposure goals set for their buildings; radiation areas were not posted consistently (some not at all); and floor supervisors were not familiar with the radiation levels encountered during specific tasks.

IMPROVEMENTS NEEDED IN FIRE PROTECTION

- There is no earthquake bracing for the sprinkler systems in buildings 776/777, 771/774, and 707. According to the TSAs, the lack of bracing could cause the sprinkler system to fail in an earthquake. Further, according to one TSA, fires are expected to occur during an earthquake because of the large number of ignition sources within some buildings.

    -- Officials at the plant do not feel it is necessary to brace the sprinkler system at this time. They told us that studies have shown that the probability of earthquake activity at or near the plant is low. Finally, they pointed out that some of the walls to which the system would be braced may not withstand a large earthquake.

    -- There is an existing program to structurally upgrade plutonium facilities at RFP, and recommendations to include bracing the sprinkler system as well as other pipes and equipment will be considered.

- Many of the buildings and plutonium facilities at RFP have antiquated fire detector/alarm systems. For example, the systems in building 776/777 are from 16 to 35 years old, and spare parts are not available. Many aspects of the existing system do not meet current codes.

  -- According to plant officials, the fire detector systems are monitored constantly to ensure that they are in working order. Partial solutions to address the most critical fire protection needs have been identified, and funding is planned in fiscal year 1993.

  -- The TSA for building 776/777 points out that a wait of 5 years to replace the existing system is excessively long. According to plant officials, accelerated funding for this upgrade has been proposed to DOE.

- The TSAs identified a number of fire protection concerns in the day-to-day operations of the plant. These included combustibles being stored in hallways, the deterioration of fire doors, and poorly marked egress routes.

  -- Plant officials undertook a comprehensive program to improve the plant's housekeeping practices. Fire doors were replaced or repaired, and priority emphasis was given to removing combustibles and clearly marking egress routes.

  -- A September 9, 1988, internal appraisal found considerable progress was being made to replace and repair fire doors, clearly mark egress routes, and reduce the storing of combustibles. However, the study noted that management systems and controls are not adequate to ensure that these recently implemented actions will be continued for even a short period.

- The TSAs identified numerous actions to enhance fire protection at the plant. These include upgrading automated fire detection within certain areas of the plant, improving the integrity of fire walls, and providing fire-resistant vaults. In general, plant officials told us that they believe their existing systems are adequate to protect workers and the public from fires.

SECTION 3

ENVIRONMENTAL CONTAMINATION AT ROCKY FLATS PLANT

Environmental contamination at Rocky Flats Plant (RFP) is a significant problem. According to current DOE estimates, it will cost $323 million through fiscal year 1995 for corrective actions to reduce sources of and clean up existing environmental contamination. Beyond 1995, DOE estimates that it could take between $120 million and $180 million to complete the environmental corrective actions.

Under various state and federal laws, regulations, and executive orders, DOE, the Environmental Protection Agency (EPA), and the Colorado Department of Health have responsibility for protecting the public and the environment from hazardous and radioactive wastes generated at RFP. To mitigate overlap of authorities and duplication of effort, DOE, EPA, and the State of Colorado entered into a compliance agreement in July 1986 to establish requirements concerning the past and present handling of hazardous and radioactive waste. The agreement established requirements for: (1) remedial investigations to fully determine the nature and extent of any threat to the public or the environment that may be caused by the release or threatened release of hazardous substances from RFP; (2) feasibility studies to identify and evaluate alternatives for appropriate remedial action to prevent or mitigate the migration of any hazardous substance from the plant; and (3) implementation of remedial action as may be necessary to protect the public health and welfare or the environment.

On the basis of past GAO reports (see appendix I) and DOE documents, two major environmental problem areas at RFP warrant detailed discussion. First, groundwater contamination has been found to exist in some on-site locations at concentrations as high as 1,000 times EPA's drinking water standards. Second, numerous inactive waste sites are located at RFP with the potential for releasing radioactive or other contaminants into the environment. The following sections describe the problems and DOE's efforts to resolve them.

GROUNDWATER CONTAMINATION

- In 1985, Rockwell conducted a preliminary screening of plant drinking water, surface water, and groundwater and found elevated levels of four highly toxic (nonradioactive) chemicals in eight on-site groundwater monitoring wells.

- In 1986, a Rockwell monitoring report revealed numerous types of contaminants in the groundwater at Rocky Flats Plant. These included nitrates, solvents, selenium, and radioactive materials.

- Levels of solvents in the groundwater were as high as 1,000 times the drinking water standards at some locations. Levels of other chemicals such as selenium have been measured at or slightly above the drinking water standards at various locations. Radioactive material has been detected in the groundwater at levels above EPA's drinking water standards.

- There is no evidence that groundwater contamination has moved off-site. Further, plant officials told us there are no private drinking water wells in jeopardy of being contaminated. However, DOE officials recognize that the contamination could migrate off-site and thus be a potential hazard to human health.

- Inactive waste sites are one of the principal causes of groundwater contamination. A number of such sites were identified at Rocky Flats as potential sources of groundwater and soil contamination.

- Existing monitoring wells and data were inadequate to accurately define the horizontal and vertical extent of groundwater contamination. RFP is conducting a major effort to install additional groundwater monitoring wells. RFP has identified an additional 275 wells to be installed in fiscal year 1989.

- To better assess the nature and extent of contamination and characterize the sources of contamination, the RFP staff has given priority to remedial investigations for all areas suspected of being groundwater contamination sources.

INACTIVE WASTE SITES

- A total of 108 inactive waste sites have been identified at RFP. Some of these sites are considered to be existing or possible sources of significant environmental contamination. Further, some off-site areas have been contaminated with low levels of plutonium.

- Of the 108 inactive waste sites identified, RFP officials have given a high priority to 27 sites, which have been grouped together in four areas because of their general proximity. These areas are (1) the 881 Hillside area, (2) the 903 Pad area, (3) the Mound area, and (4) the East trenches area. All four areas are located within the plant boundaries.

-- The 881 Hillside area includes sites where oil sludge was dumped, unknown chemicals were buried, out-of-service fuel oil tanks were filled with asbestos and concrete, and plutonium-contaminated soil was disposed of.

-- The 903 Pad area includes sites where flattened drums with uranium and plutonium were buried, leakage from drums containing radioactive lathe coolant occurred, and a reactive metal (lithium) was buried in trenches.

-- The Mound area includes sites where drums filled with depleted uranium chips coated with small amounts of lathe coolant were buried, drums filled with depleted uranium and beryllium wastes were stored, and wooden pallets were disposed of that may have had hazardous substances or radionuclides spilled on them.

-- The East Trenches area consists of trenches that were used for the disposal of sanitary sewage sludge and flattened drums contaminated with uranium and plutonium. Also, eight of the nine trenches contain some uranium/plutonium-contaminated asphalt planking.

o The July 1986 DOE, EPA, and State of Colorado compliance agreement for Rocky Flats requires that characterization and feasibility studies and design plans be done before any environmental restoration can take place. The following are the major completed actions under this agreement that RFP reported for fiscal year 1988:

-- the draft final remedial investigation and report for the 881 Hillside area;

-- the draft feasibility study and environmental assessment for the 881 Hillside area;

-- the preliminary remedial investigation report for the 903 Pad, Mound, and East Trenches areas; and

-- the remedial investigation plans and schedules for all low-priority sites.

DOE FUTURE ACTIONS

o On July 1, 1988, DOE issued a report focusing on its nuclear defense installations and their efforts to address environmental, safety, and health problems. According to this report, DOE estimates that it will cost $323 million through fiscal year 1995 to correct or reduce the sources of environmental contamination at Rocky Flats. Beyond 1995,

DOE estimates that it could take from $120 million to $180 million to complete the implementation of environmental corrective actions.

- Key activities that DOE plans to start in fiscal year 1990 include

  -- beginning the operation of a groundwater cleanup system for the 881 Hillside area;

  -- completing remedial investigations and feasibility studies, environmental assessments, and other decision documents concerning the 903 Pad, Mound, and East Trenches areas; and

  -- further investigating off-site contamination.

- According to plant officials, all the waste may not be removed during the environmental cleanup of Rocky Flats. Should this happen, indefinite monitoring may be required at the plant to ensure that the waste does not migrate.

SECTION 4

AGING EQUIPMENT AND BUILDINGS

Upgrading Rocky Flats Plant (RFP) to maintain existing capabilities and ensure that operations are safe will cost over $1 billion. Much of Rocky Flats was built during the 1950s, and although the facilities have been subject to upgrades, there has been a general deterioration of some buildings over the years. Furthermore, some of the buildings do not meet or satisfy the more stringent construction standards that are required of today's nuclear buildings to protect against natural phenomena such as earthquakes and tornadoes. The plant layout is inefficient because of the piecemeal addition of production facilities over the last 30 years. DOE estimates that by the year 2010, most of the facilities will be nearly inoperable unless major renovation and/or replacement projects are undertaken. The following sections describe key areas where upgrades are needed and provide a perspective on the costs needed to carry out these upgrades.

MARGINAL OPERATION

- In 1987, as part of a strategic planning effort, DOE assessed Rocky Flats Plant and rated major aspects of the operations. As a result of this effort, many buildings at the plant were rated "marginal," which meant that they were in constant need of attention.

- Building 444 is a very old building and is used to manufacture nonnuclear components. The building needs a major renovation of its utility and piping systems. Pre-1960 electrical and other utility systems require considerable maintenance to function at 100-percent capacity. Obsolete equipment and facilities need to be replaced and/or upgraded. These include the substation, the ventilation system, and manufacturing equipment.

- Buildings for plutonium assembly and waste management have old equipment that needs constant maintenance. This situation has caused the operation to be shut down about 20 percent of the time in recent years. In addition, the utility system needs to be upgraded, and at some locations, the air monitoring system needs to be improved.

- Building 771 is an old chemical plant needing continual repair of tanks, piping, and utilities. Aspects of the facility do not meet current building and safety codes. The building now is operating at less than 50 percent of its original capacity.

- Some parts of the criticality alarm systems at the plant are 19 years old. Because of their age, replacement parts are difficult to obtain. Further, the criticality alarm systems are not dedicated; that is, they depend on the Public Address system to function.

VULNERABILITY TO HIGH WINDS AND EARTHQUAKES

- Some of the RFP buildings do not meet or satisfy the more stringent construction standards that are required of today's buildings to protect against natural phenomena such as earthquakes and tornadoes. In the 1950s, when many buildings were built, there were no earthquake standards.

- DOE analyses have shown that the greatest risk to the public from the Rocky Flats operations stems from high winds and large earthquakes. This risk is the possibility that plutonium could be dispersed off-site and affect the general public.

- DOE analyses show that buildings 559, 707, 771, 774, 776/777, and 779 were vulnerable to large earthquakes and, in most instances, to wind damage as well. Further, the equipment in most of the buildings is vulnerable to earthquakes.

- DOE has not assessed Rocky Flats' present underground utility systems to determine if they could withstand an earthquake and, if the systems failed, what impact that would have on workers and the public.

- DOE does not believe there is undue risk in continuing operations at Rocky Flats. Nevertheless, DOE is taking a three-phased approach to lower the risk from earthquakes and high winds at Rocky Flats.

    -- Under phase I, DOE is currently upgrading the structures of buildings 707, 776/777, and 779 to lower the risk from earthquakes and wind damage. Structural upgrades have already been completed for building 559. The estimated phase I cost is about $8 million.

    -- Under phase II, DOE would upgrade the remaining buildings at the plant to lower the risk from earthquakes and wind damage. However, phase II, estimated to cost about $22 million, has not been approved for funding.

    -- Under phase III, DOE estimates that it will cost about $39 million to upgrade the equipment in

various plant buildings to make it less vulnerable to earthquake damage. This phase, however, has not yet been approved by DOE.

BUILDING 371 NEEDS TO BE REBUILT

- Building 371 was constructed in the late 1970s to replace older buildings such as building 771, which is an old chemical plant needing continual repair of tanks, piping, and utilities. Because of building 771's poor condition, DOE planned to phase out production there and move production to building 371.

- Building 371 was designed to meet today's earthquake standards and lower workers' exposure to radioactive material.

- In building 371, most of the production process, except for waste recovery, never operated as intended because of poor process design, the use of inappropriate construction materials, and changes in safeguards and safety requirements.

- Because of these problems, work is continuing in the older building 771, which was to be replaced. The potential for radiation exposure to workers in the older buildings is greater than it would be if building 371 was fully operational.

FUTURE COST

- A modernization plan for the entire nuclear defense complex is scheduled to be issued by DOE on December 15, 1988. As part of the plan, DOE will consider various options for the future utilization of the plant, including relocating some activities.

- Preliminary estimates by DOE indicate that rebuilding and upgrading RFP may cost over $1 billion. Major upgrades include rebuilding building 371 and upgrading plutonium manufacturing and assembly processes.

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APPENDIX II

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